

79.
LIBRARY
BOARD OF TRADE



OBSERVATIONS

On a PAMPHLET lately published,

ENTITLED,

REMARKS *on the different*
Constructions of BRIDGES, and
IMPROVEMENTS, &c.



Letter to the
Secretary on Bridges

1747-1772

By J. Smeaton

BOARD OF TRUSTEES

RESERVATIONS

OF THE

REMAINS OF THE
CONFEDERATE ARMY
IN THE

STATE OF

MISSISSIPPI

1
OBSERVATIONS
LIBRARY
ON A BOARD OF TRADE
PAMPHLET

Lately Published, Entitled,

REMARKS *on the different Construc-*
tions of BRIDGES, and IMPROVEMENTS
to secure their Foundations, &c.

By CHARLES MARQUAND.

IN WHICH

The *Puerility* of that PERFORMANCE
is Considered.

— *Meliora pii docuere Parentes.* HOR.



L O N D O N :

Printed for the AUTHOR,
And Sold by W. OWEN, at *Temple-Bar.*

M.DCC.XLIX.

23/2

Observations

А И О

P A M P H L E T



OBSERVATIONS

On a PAMPHLET lately published,

ENTITLED,

REMARKS *on the different Construc-*
tion of BRIDGES, &c.



SOME few Days since, seeing an Advertisement of a Treatise, entitled, *Remarks on the different Constructions of Bridges, and Improvements to secure their Foundations on the different Soils where they are intended to be built, which hitherto seems to have been a Thing not sufficiently considered,---* I was induced to give it a Reading, expecting to have met with something very extraordinary, from a Person who makes so great a

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Stir

Stir and Bustle in the World, and such Pretensions to Ability for Works of this Nature. The Title Page promises to open a vast Field of Knowledge, and in such a Light that might induce us to believe it, since he says it *hitherto seems to be a Thing not sufficiently considered.* --- But upon Enquiry, I shall observe he has not in one Point made good any Part of his Promise ; that he has not made Remarks on the *different Constructions of Bridges*, nor any Improvements to secure their Foundations, nor of the different Soils where they are intended to be built.

Our Author begins with informing us, Page 3, *That first the Foundation intended must be carefully bored.* --- This Method was practiced long before the Author came from *Guernsey*, or before Mr. *Self-sufficient* came to *England* :--- He might have seen *that*, and *Piling* treated of, in Mr. *Gautier's Trait de Pons, Paris, 1716, 12mo.* and even the Method
he

he lays down was published by Mr. Langley, in his *Survey of Westminster-Bridge, as it is now sinking into Ruins, in 1748,---* and the Manner of boring and judging of the different Stratum of the Soil, is set forth in his Remarks in the said Pamphlet, and also in another published in 1738, entitled, *A short Narrative of the Proceedings, &c. for building a Bridge at Westminster,---* Page the 7th. That the Ground upon boring it, proved very unfit for the Foundation of a Bridge.---There is also in this and the 8th Page, the different Stratum at the *Horse-ferry*, and at *Stangate-Wharf*. Our Author proceeds, and tells us, Page 4th, that if the "Foundation does not prove equally firm under each Pier intended, it must by Art be made sufficient, --- *Piling it all over, &c.* and then INCLOSING it, with *Dove-tailed Piles*.---First as to the Piling: In *Palladio's* first Book Chap. 7th, he says " If we build in the Water, we must dig (or bore) into the Sand or Gravel, and drive in

Piles of Oak till the Ends reach the good Ground, and on these we may build.--- Again, --- If the Earth you build upon be very soft, as in marshy Grounds,---you must strengthen with *Piles*;---these *Piles* must be drove in so *contiguous* to one another, that no others can be set between them. ---In the 8th Chapter, he tells us, “The Ancients used to pave the Plan with *Tivertine*, but we lay Planks or Beams when we build, and also, sometimes in order to prevent Expence, and particularly in marshy Grounds, where we are forced to make use of *Piles*.” Thus far *Palladio*; long before our Author advised.

And as to “*Enclosing it with Dove-tailed Piles*, the same Method was proposed by Mr. *Langley* in 1737, in his Reply to Mr. *James*’s Review, in Page 42.”--- ‘ If in the Foundation, the Limits of the Base of every Pier be BOUNDED with *Piles* dove-tailed together, there is no doubt but that the greater the Number of *Piles* driven within them
are,

are, the more compact that enclosed Foundation will be, &c. And in Page the 26th and 27th, MONSIEUR PALLAPLANCE may see Rules long before, laid down more *particular* and more *eligible* than his own.'

From what I have before observed, it is evidently demonstrated that contrary to his Assertion, these Things have been long since *sufficiently considered*,---that there is nothing new in what he has hitherto proposed, nor any Improvement made upon any one Article as he has set forth in his Title Page.

I cannot leave this Article without making a Remark upon a Comparison of his (Page 3d and 4th) of an expert Sugar Cooper's *boring* a Cask of Sugar, and *boring* for a Foundation, &c.---he says, " This must be done till you are satisfied, &c. and to *pile* it thicker or thinner as the Nature of the Spot may require."--This is a Method he proposes, but how
you

you are to be governed in your Judgment as to the Use, Capacity, or Certainty of the different Stratum, Piling, or other Security for the Foundation, he has neither mentioned, nor laid down any Sort of Rule, nor has he himself, I believe, *sufficiently considered*.—

He should have set forth, what Constructions shall be made of the Soil after *boring*, what Methods to use for different Stratum, &c. since as he says in his 7th Page, that *Gautier, Gabriel, and Lambote*, apprised him of *all* the Difficulties attending Works of this Kind ; and if they were so communicative, I do not doubt but that the Brewers *empty Barrels* (he speaks of Page 13.) to help to float his Pier, was one of the wonderful Secrets he was permitted to know.

It need not be wondered at the Authors speaking favourably of, and recommending *French* Engineers and
French

French Methods, without one Word of the Ability of the *English*.---Nay he even passes over the never-to-be-forgotten Error, or want of Judgment in Mr. *Self-sufficient*,---and palliates the Blunder in Page 6th, by saying it is a Misfortune might have befallen any one; and to keep him in Countenance, says, the Bridge over the River *Allier*, in the City of *Moulins*, fell down as soon as the Centers were struck,---but to preserve sacred the Genius of foreign Countries, he says, Page 7th, *Every Body* knows that *France* abounds with great Engineers. — We have, I confess, a glaring Instance of foreign Ability in the Ruins of WESTMINSTER-BRIDGE.

Page 7th, (*Monsieur Pallaplace*) the Author tells us, that he found, by the friendly Instructions of Mr. *Gautier*, *Gabriel*, and *Lambote*, with whom he conversed at *Paris*, they were *all* Persons of great Judgment and Ability, and that they did not
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endeavour to keep Works of this kind a Secret, but apprized him of *all* the Difficulties that might attend them.

If this is true, I am sorry his Memory could not retain something which they have not already exhibited to the World for the Advantage of Mankind : For that which has hitherto been advanced by *him*, is so universally known, so *low* and *trifling*, that I could wish these his *Improvements*, as he is pleased to call them, had been still kept by him a Secret.

I come now to that Part of his Title Page, where he says, “ *To secure their Foundations, &c.* ” which hitherto seems to have been a Thing not sufficiently considered :

I think in the short Narrative beforementioned, published in 1738, Page 7th, there is an Account of the different Stratum, --- “ That there was a considerable Depth of hard
Gra-

Gravel which reached $\frac{2}{3}$ of the Breadth from *Westminster* Side, and that the other $\frac{1}{3}$ lay much lower, &c." and that it would be impossible on THAT to make a good Foundation without PILING all under the Piers, --- so that they doubtless set forth and *considered* the different Stratum, both at the *Horse-ferry*, and *Stangate-Wharf*, the *Horse-ferry* was by far the best and safest Foundation.

The Foundation at *Stangate* required Attention,---and consequently more so, as being a Work of so public and so general Concern to the Community,---but either through *Ignorance*, (which I rather impute to Mr. *Self-sufficient*) or to *Obstinacy*, I will not say wilful, (in rejecting the Advice, or Opinion of that far greater Genius, Mr. *King* deceased), the Structure is now rendered a Reproach on our Country, and if he means by the Thing not being *sufficiently considered*, his Reflection is cast upon Mr. *Self-sufficient* the FOREIGN ENGINEER ;

B for

for in the preceding Paragraph, it appears the Thing had been before set forth in the Report, and had been sufficiently considered. --- And though our Author of the Remarks (as it is reported) may be employed in the Repairs of that Structure, I dare affirm his *Brewer's empty Barrels*, or his own *empty Pate* will prove ineffectual in endeavouring to move the present *sunk Pier*, or to float another of the same Magnitude out of the *Mason's Yard*.

In the 7th Page, our Author tells us, that *Gautier*, &c. communicated to him, and he reduced into Practice their useful Advices, and he Instances in two Things, --- *Brentford*, and *Chertsey* Bridges. --- The first is comparatively speaking over a *dry Ditch*, with two natural and firm Buttments, --- the other requires no particular Ability, since *Putney, Kingston, Staines, Datchet, Maidenhead*, &c. Bridges have been all built, or repaired long before he had any Thing to do at
Chert-

Chertsey,—and Things of this Nature are frequently practised by every Country *Bricklayer*, and *Carpenter*. What *Improvements* he has made in either I never heard ; but he does not mention a Word of the *Great* Talent of Improvement of his, and that is, his wonderful Skill in repairing Breaches made by Water, and *drawing Fenns*, and *marshy Grounds*, of which he at *Limington*, and in an *Estimate* made for *Sluices* to draw the *Fenns* in *Lincolnshire*, lately obliged the World with Specimens of his Ability, which is, I believe, one of the *Secrets*, and which will remain so to him, to the End of Time.

We are now opening to the GRAND SCENE of *Secrecy*, Page 8th, which he offers to the World in general, and that is to prepare the *Piers* of any Bridge a Mile or two from the Place of erecting such an *Edifice*, — (*especially where the Tide Ebbs and Flows*) and the *Piers* may be floated there whole, and so set down upon a found

Foundation well secured, as recommended Plate 1. and 2. *and had been by SERLIO, (and PALLADIO near 200 Years ago)* and this is to be performed with *empty Barges, empty Barrels, and empty Skulls.*—He makes no Difficulty of carrying 900 or 1000 *Ton* Weight, hung in the Air, nor no Difficulty to let it down any where, deep, or *not deep* enough to *float*, because he makes Use of the Expression (*especially where the Tide Ebbs and Flows*) and then drop it plump on its intended Bed.

This Weight is to be hung up with Wood-screws, and *Hooks and Eyes*, as Boys Breeches are sometimes hung. —But that such a Weight hanging by Irons and Wedges as is shewn in the Section, and that Wedges and Screws can tuck up and carry 900, or 1000 Tons Weight a Mile or two without racking or dislocating the Pier, and how a Depth of Water could be obtained at *Westminster-Bridge* for that Purpose for each Pier,

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in *Theory* may look possible, but in *Practice* seems to me a little unaccountable, and which I shall presently more fully explain.

The weighing a sunk Weight, or Vessel, is every Day practised, and the Method in general very well known, but how *this* could succeed if attempted is not so well understood.

According to the Section in the 2d Plate, the Pier contains $\frac{4}{3}$ Part of the Breadth of the three Barges, so that the Center of the Weight lays on the middle Vessel; this unequal Weight, notwithstanding the *empty Barrels will* wreck the Vessels and the Pier, and how the Irons and Hooks and Eyes will sustain the Weight, or hold the lower Float of Timber, or how the Blockings marked F. F. &c. or the thin Cortex of the Vessel, which according to the Scale is not four Inches thick, and the extream Distance of the two outer Barges

Barges from the Center of the Weight, I say how all this is to be, or intended to be done, is as chimerical as some other Undertakings of this great *Author*, and *Engineer*.

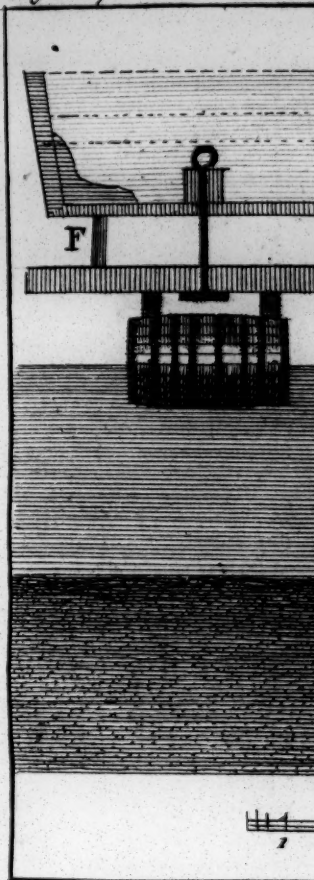
In the 8th Page, he tells us, “ The Piles may be cut off under Water, smooth and level, by a *particular Machine*, the Model of which may be viewed at the Place of Sale of his Pamphlet, or at the Author’s House. —I for my Part have not seen it,—but if it be of the same Sort that he told the Honourable the Commissioners of the Bridge after he had contracted for cutting off the Piles some time ago, which he said his Servant in his Absence had lighted the Fire with ; —I do prophecy it will be of little Use to himself, or the Public, —for though such might be once in Being,—and his Servant *wilfully*, or by *Accident* destroyed it, it was surely in his Power to make such another with IMPROVEMENTS, and not solicit

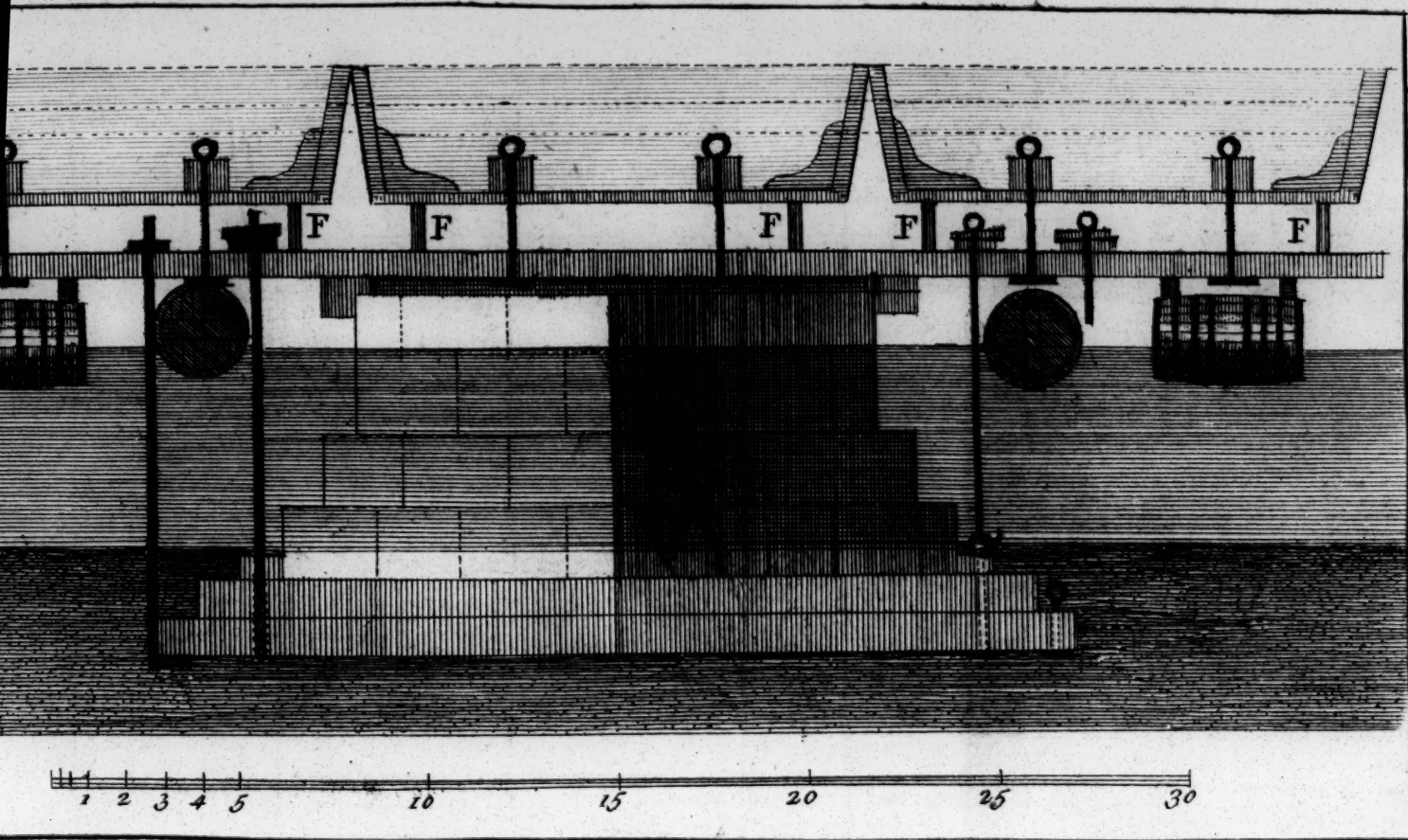
licit the Commissioners to cancel his Contract.

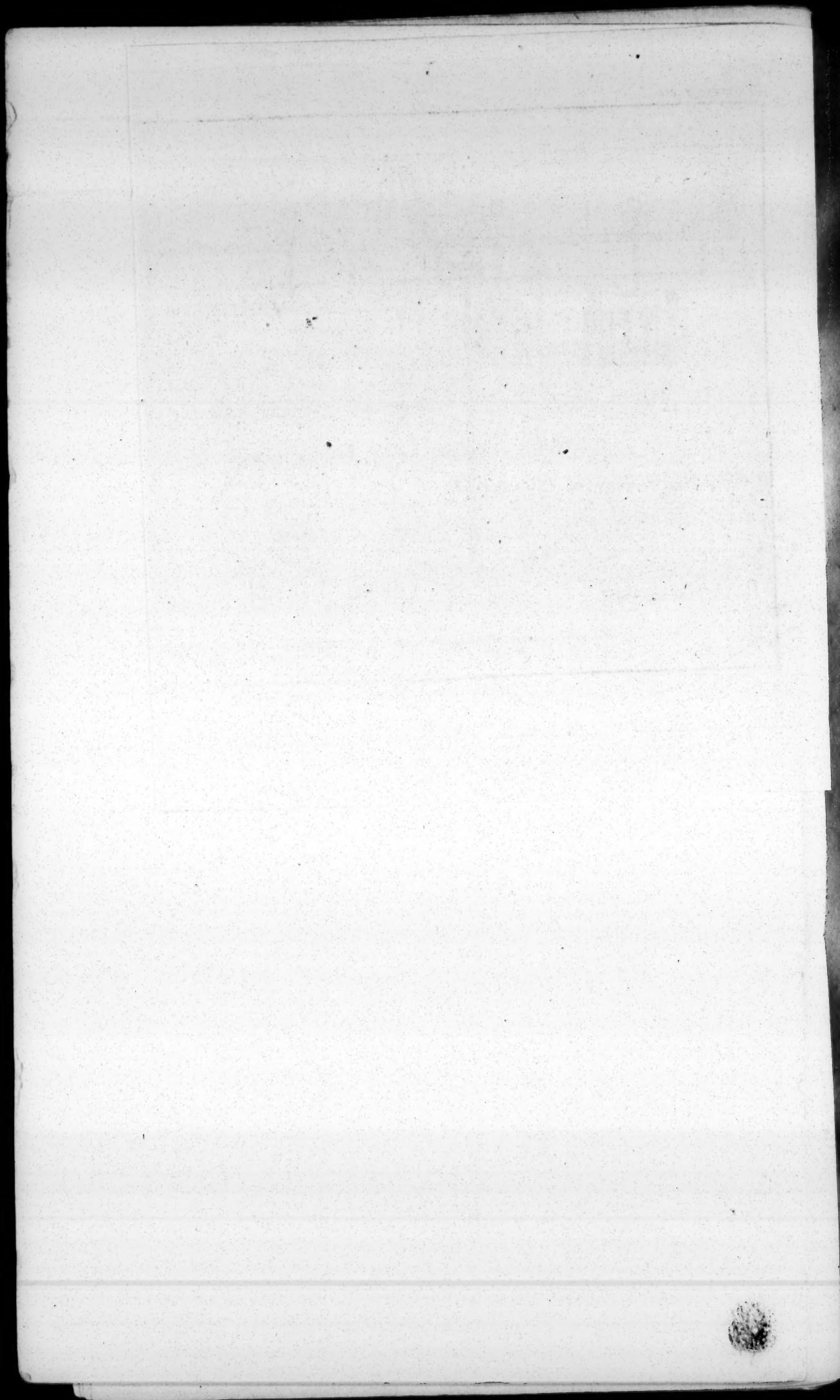
The Instrument, and Flying-Arch, Plate 4th, have nothing in them deserving Attention, I think Mr. *Halfpenny*'s proposed Truss much better, more certain, simple and mechanical than his; and as to the Instrument for the driving the Piles,—and the notching the Pile marked M. on the one Side, and Dove-tailed on the other, will so weaken it as to render it useless. —Again, if the Pile is notched, there can be no Certainty of its being as deep as it will go, to receive the End of the Timber under the Pier, whether you can drive it so far, or whether you could not drive it lower than the Notch, and how the Pile marked N. should force it Side-ways four Inches, when at the farthest Depth it can go, —are Things I range among the Number of the *Improbables*.

I must here make an Observation on the Section of the Float, Plate 2d, where I find the Irons which go through the Bottoms of the Barges to hang up the Floor, as is shewn in the Section, go also through Blockings set on the Bottom of the Barge; these Irons are to be turned, &c. then consequently they must be loose to turn freely,—or not so close confined as to keep out Water, if it should be higher than the Top of these Blockings. — Now the Barges are by the Scale annexed in that Plate, three Feet six Inches high, or deep within-side, and the Blockings are only one Foot high, — so that the Barge must not be sunk deeper on the outside than one Foot, and the thickness of the Bottom, if it is, the Water will come in through those Holes where the Irons are, and sink the Barge. Those Blockings should be as high within-side as the Barge is, for if it is not intended to sink lower than one Foot, how is it possible the Float should take
up

to face p. 26.







up 900 or 1000 Ton Weight. I take it for granted, that the *Barges* when deep, only $\frac{1}{3}$ of their *Height* can raise only $\frac{1}{3}$ of their *Burthen*, either by *Internal Lading* or *External Weighing*; and if this is the Case, the Vessels, if *Loaded* or *Sunk* near to the Top, would carry 2,700 or 3000 Tons, according to his Proposition: How the Author could compass a Work of this Kind, I am at a Loss to conceive.

There is a Passage, Page 13th, which wants Explanation: The Author says, “ *The sinking Pier of Westminster-Bridge weighs 900 Tons, within two Feet of Low Water Mark, --- but as Portland Stone weighs less than $\frac{2}{3}$ of its absolute Weight in Water, which reduces the Weight to less than 600 Tons, &c.* ”

If the present Pier (now *Immersed* in Water) weighs 900 Tons, within two Feet of Low Water Mark; then according to the Doctrine of Weights Immersed in Fluids, the absolute

C Weight

Weight of the Pier, when dry, in itself weighs 1,350 Tons --- according to his Calculation. And that this is his Meaning, is very evident, because he says it DOES weigh, that is, now weighs 900 Tons. --- If he had meant it *did* before the *Immersion*, I should have comprehended his Meaning.

Chambers, in his *Cyclopedia*, --- speaking of the *Immersion* of Weight in *Fluids*, in his Explanation of Hydrostatical Balance, and of *Weights, Fluids, Gravity*, &c. the Theorem he advances in all is, " A Body heavier than Water, weighs less in Water than in Air, by the Weight of as much Water as is equal to its Bulk, and the Difference is set forth in a Table of Specifick Gravity of Solids, that Stone is as 14 to Water 5 and $\frac{1}{3}$, which Calculation is near enough for his Enquiry and mine.

Supposing it, as he says, something less than $\frac{2}{3}$ of its absolute Weight when in *Air*, he must mean the Pier did weigh

weigh 1,350 Tons, before it was in the Water, or he could not say it *now* weighs 900 Tons, because of its Immersion and Decrease of $\frac{1}{3}$ of its Weight, or he must confess that the Pier *now* under Water, will also be of equal Weight to his new intended Pier when it is floated in Water ; and when so immersed will *then* be of equal Weight with his present Pier of 900 Tons, provided they are, and it is suppos'd he means and intends them in his Proposition, to be of equal Magnitude.

If then he means, that in the Immersion, the Pier weighs (that is, does now weigh) 900 Tons, and that the Float can according to my first Observation raise only $\frac{1}{3}$ of the Weight intended to be rais'd, (because of the Irons which go through the Bottoms of the Barges, and through the Blockings, which are but one Foot high within the Barge) then consequently he can with those Barges, as they are now delineated, raise only 300 Tons, which is $\frac{1}{3}$ of the Burthen they ought

to weigh, if the Vessel had its due Lading or Weight.

But if his Machine, when loaded to its due Burthen, is to raise the 900 Tons, and that is his supposed Weight, and that his Float as it is *now* represented, can raise only 300 Tons, which I suppose he meant it should *then* raise ; --- I say, if according to the Section, it could then raise 600 Tons, if it was sunk three Feet under Water, which, according to *his* Scheme, can be but one Foot, even by the Diminution of its Weight in Immersion, it should weigh up 1,800 Tons, or if by his first Proposition of the present Weight of 900 Tons, if the Vessels were sunk as low as is before observ'd, they would weigh up 2,700 Tons ; and in both these Cases it is not demonstrative that any Vessel or Vessels can perform the Operation at the Place proposed.

But as it most certainly appears in the Light I view it, that Mr. *Palaplace* means the Pier *now* immersed,
is

is 900 Tons Weight, and that the Vessels or Float he proposes can *now* weigh in its present Situation of the short Blockings, &c. only $\frac{1}{3}$ of that Bulk or Weight, it must imply that 2,700 Tons Weight, if the Float was sunk to its proper Depth, might be carried a Mile or two, and set down at the Discretion of our Author.

If these were the Secrets communicated to him by Messrs. *Gautier*, *Gabriel*, and *Lambote*, in their Conversation at *Paris*, I could wish for theirs and his Sake they had still been a Secret, or that they had been represented in such a Manner, as to convince the World what Improvement he has made on the Construction of Bridges.

In tracing the Author to this Place, I do not find he has any where made out one Assertion of his Title Page, he has made no Remarks on the different Construction of Bridges --- has not set forth the Opinions of *Serlio*, *Paladio*, *Gautier*, nor other Writers on
this

this Subject, --- nor the manner of executing Works of this Kind, tho' practised by others, and consequently has not considered the Constructions or different Constructions of Bridges ; and as to the next Part, I think I have sufficiently prov'd in the preceding Part of my Observations, that he has made no Improvements to secure their Foundations, nor has he any where attempted to prove what he affirmatively asserts, and that is, -----
“ which hitherto seems to have been a Thing not sufficiently considered.

Had the Contents answered the pompous Title as I expected, had any Improvements been made on what has hitherto been known and practised, I should have congratulated him for his benevolent Goodness in communicating it to Mankind, and have look'd on his Performance in a far different Light than I now view it ; but as no *one* Point is made out, to answer what he promises in his Title Page, I shall conclude from thence, that what
 he

he has wrote, “ *seems to have been a Thing not sufficiently considered by him.* ”

I may have perhaps carried my Speculation too far, but this is also (like his) submitted to the Publick.--- Genius sometimes wanders, and is blindfold — and mistakes its way ; — Falshood is often disguised in the Habit of Truth ; and I think Infallibility no Man can claim a Right to. The Observations I have made were merely Curiosity, and I hope the Author will as *impartially* and *candidly* read *them*, as I did *his* Remarks : I shall conclude with my Wishes for Success to ARTS and SCIENCES, and with an Observation of Mr. POPE's in his *Essay on Criticism* :

One Science only will one Genius fit,
So vast is Art, so narrow Human Wit.

Risum teneatis Amici ? —

HOR. ART. POET. 5.

F I N I S.

(23)
has wrote a letter to the
King see [illegible]

I have had perhaps carried my
visions too far. This is also (like
the) admitted to the Public - Co-
me sometimes wonder, and is blind-
fold - and [illegible] - Fall-
hood is [illegible] in the Habit of
Trust; and I think [illegible] to
the [illegible] of [illegible]. The Op-
erations I have made [illegible] [illegible]
[illegible] and I hope the [illegible] will
be [illegible] [illegible] [illegible] [illegible]
as [illegible] [illegible] [illegible] [illegible]
with my [illegible] [illegible] [illegible] [illegible]
and [illegible] [illegible] [illegible] [illegible]
vision of [illegible] [illegible] [illegible] [illegible]

One [illegible] only will [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible]

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